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(71) Applicant(s)
Robert Bosch GmbH
(Incorporated in the Federal Republic of Germany)
Wernerstrasse 1, Postfach 30 02 20,
D-70442 Stuttgart, Federal Republic of Germany

(72) Inventor(s)
Manfred Buck
Juergen Veit
Siegfried Fehrle
Wilfried Kabatnik
Thomas Dahler

(74) Agent and/or Address for Service
A.A.Thornton & Co
235 High Holborn, LONDON, WC1V 7LE,
United Kingdom

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B4C C1BX

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GB 2322576 A
GB 2286351 A
US 5000631 A
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EP 0765707 A2

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(54) Abstract Title
**TOOL HOLDER FOR A DRILLING AND/OR STRIKING TOOL**

(57) The invention proceeds from a tool holder for a drilling and/or striking tool machine, having a basic body (10, 12), which has a location opening (14) for inserting a tool shank (16), having at least one locking element (18), which for locking the tool shank (16) engages with an inner end (20) radially through a hole (22) in the basic body (10, 12) into the location opening (14) and is adjustable by means of an actuating element (24, 26) out of a locking position into an unlocking position and vice versa, and having a clamping apparatus (28, 30), which comprises at least one actuable clamping element (32, 34) and at least one supporting element (36), to which elements connecting means (38, 40, 42, 44) are applied for bracing and fixing the locking element (18).

It is proposed that the clamping element (32, 34) is designed as a separate component to the actuating element (24, 26).

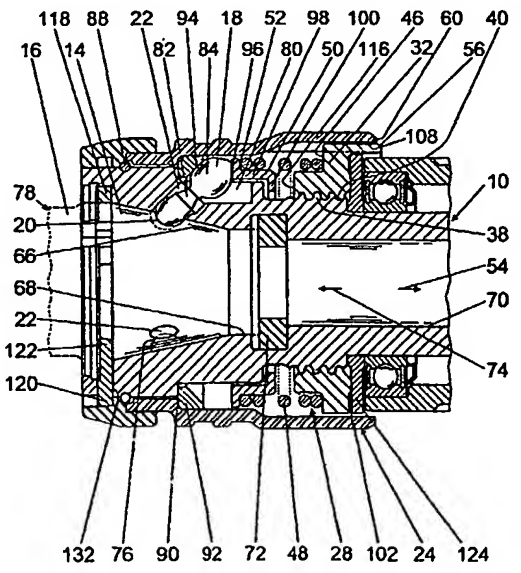


Fig. 1

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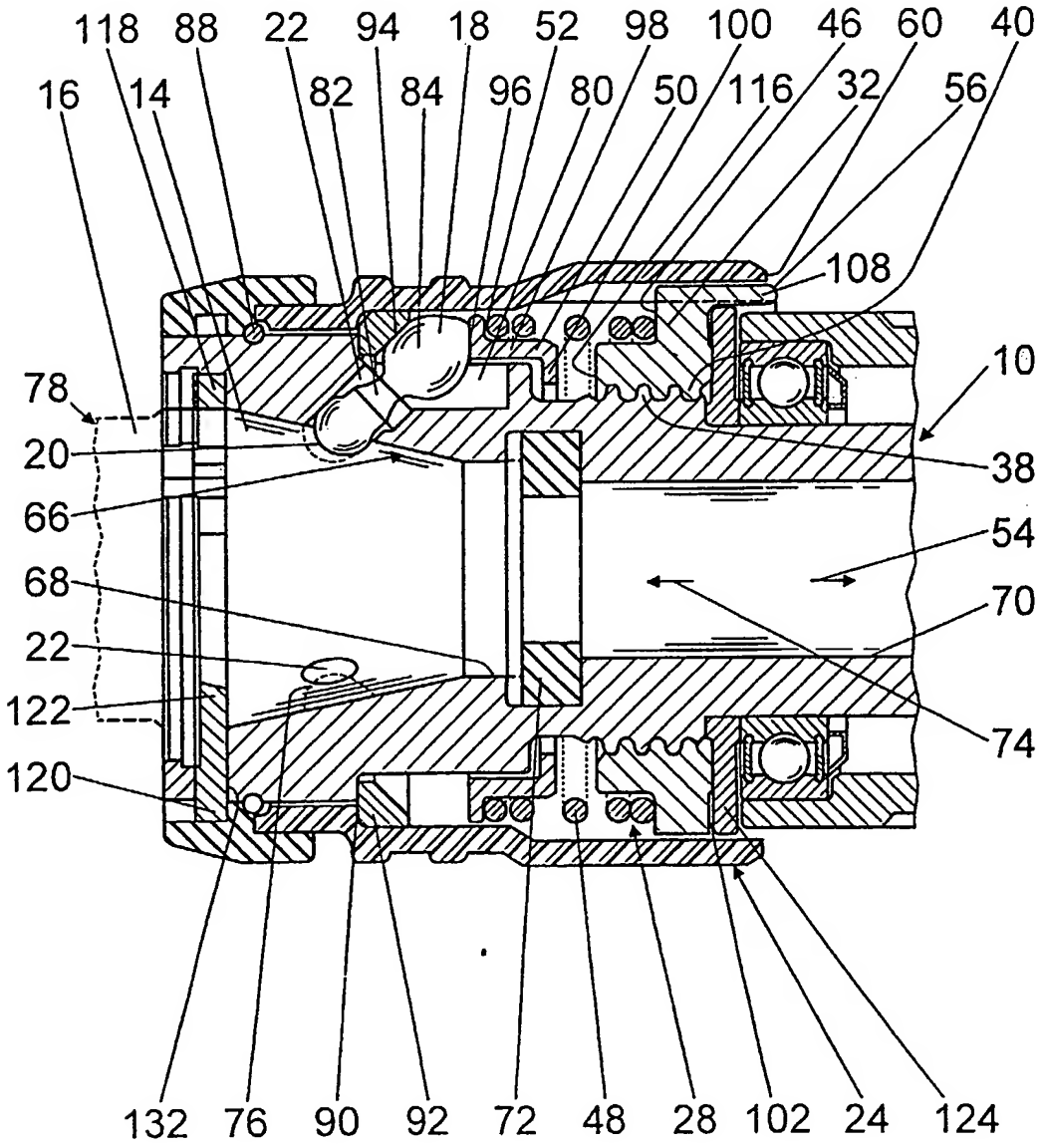
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Fig. 1

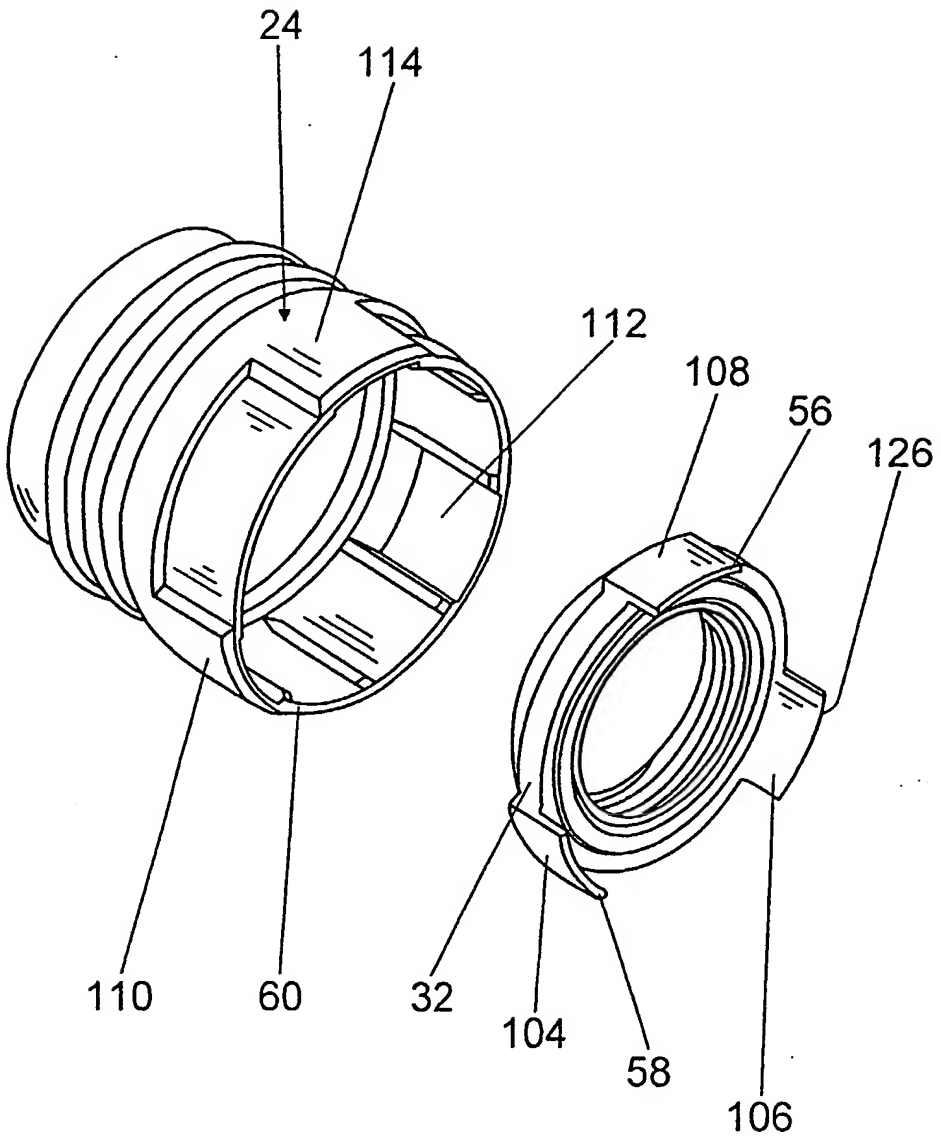


Fig. 2

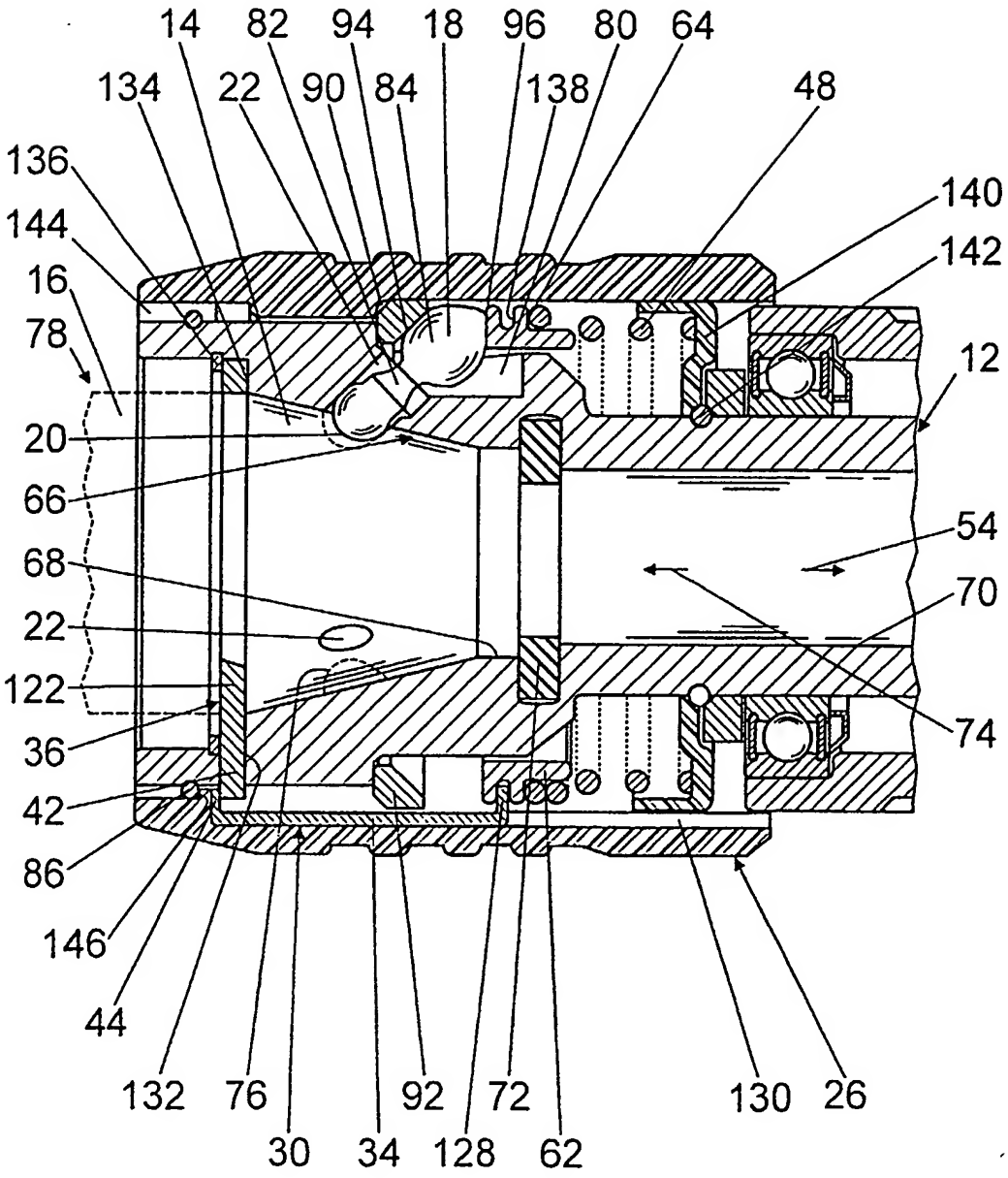
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Fig. 3

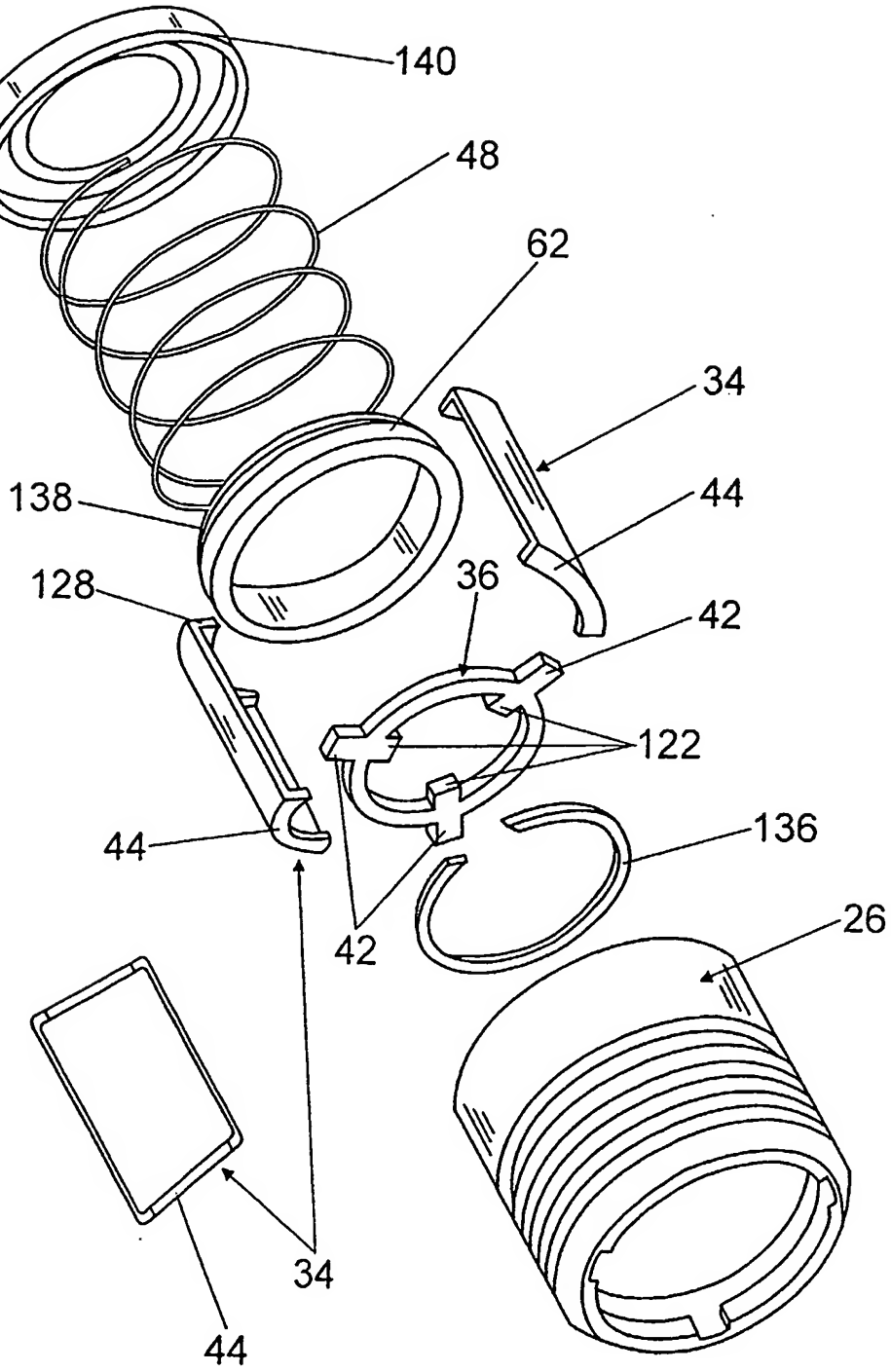


Fig. 4

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# Tool holder for a drilling and/or striking tool machine

The invention proceeds from a tool holder for a drilling and/or striking tool machine according to the preamble of claim 1.

From EP 0 765 707 B1 a generic tool holder is known. The tool holder comprises a receiving sleeve and/or a basic body, a ring acted upon by a compression spring and cooperating with a plurality of locking elements, which are movable into a conical location opening. The tool holder further has an actuating sleeve, which may be offset axially relative to the receiving sleeve. The receiving sleeve has lateral through-openings in the region of the location openings, in which the locking elements are supported so as to be substantially radially offsettable.

In order to improve centring of the drilling or cutting tool, increase a clamping force of the locking elements and guarantee perfect concentricity, on the receiving sleeve and on the actuating sleeve connecting means in the form of threads are provided, by means of which the locking elements may be braced and axially fixed. For bracing and fixing purposes, the actuating sleeve is screwed by means of an internal thread onto an external thread of the receiving sleeve. The actuating sleeve, in said case, via a stop formed on its internal contour by a spring ring, via a supporting ring and via a damping element displaces a bearing sleeve against the locking element. The axial displacement of the actuating sleeve moreover further preloads the compression spring, which at an end remote from the locking element is supported via the damping element, the bearing ring and the stop

against the actuating sleeve. The locking elements are pressed by the bearing sleeve and the compression spring axially against an oblique face, with the result that the axial force is deflected into a radially inwardly directed force, and the locking elements are pressed radially inwards into a groove of a chucking shank of the drilling or cutting tool.

To unlock and/or remove the drilling or cutting tool, the internal thread of the actuating sleeve is unscrewed from the external thread of the receiving sleeve. Then the actuating sleeve with a stop formed thereon is displaced axially against the locking elements, with the result that the latter are swivelled radially outwards into their release positions.

The invention proceeds from a tool holder for a drilling and/or striking tool machine having a basic body, which has a location opening for inserting a tool shank, having at least one locking element, which for locking the tool shank engages with an inner end radially through a hole in the basic body into the location opening and is adjustable by means of an actuating element out of a locking position into an unlocking position and vice versa, and having a clamping apparatus, which comprises at least one actuable clamping element and at least one supporting element, to which elements connecting means are applied for bracing and fixing the locking element.

It is proposed that the clamping element is designed as a separate component to the actuating element. Advantageous design clearances may be created and in particular the connecting means may be disposed fully inside and/or radially within the actuating element so as to be always protected from external influences such as e.g. dust etc. The connecting means may be held in

engagement during unlocking by the actuating element, with the result that improved handling may be achieved and the wear of the connecting means may be reduced. A constant re-engaging of the connecting means is avoidable. Loading of the actuating element by direct clamping forces may be avoided and the actuating sleeve may be made of a lightweight, inexpensive material such as, in particular, a plastics material, which may advantageously serve e.g. as a guard against accidental contact in the event of increased temperatures and/or against electric voltage. Furthermore, a relative movement between the clamping element and the actuating sleeve may advantageously be utilized to trigger a signal, e.g. to trigger an electrical signal, so that the drilling and/or striking tool machine may be operated only with the locking elements braced and fixed, and/or to trigger a visual signal for the operator, which tells the operator whether the locking elements are braced and fixed.

The clamping element may be actuated in principle by an additional actuating element or advantageously by the already provided actuating element, thereby saving additional components, installation space, weight and assembly outlay.

In a further refinement of the invention, it is proposed that the connecting means are designed as threads, which are constructionally easy to manufacture and by means of which tolerances may be easily compensated.

To save additional components, installation space and assembly outlay, the clamping element is advantageously formed by a component, which forms a spring support for a compression spring loading the locking element, and/or the clamping element in the locked state acts upon the locking element via a component, which forms a spring

support for a compression spring loading the locking element. When the clamping element is formed by a component forming a spring support, a clamping force of the compression spring which increases as a result of the clamping operation may moreover be advantageously utilized.

The clamping element may in a constructionally particularly simple manner be utilized to trigger a signal, in particular to trigger a visual signal for an operator, in that the clamping element in the locked state is disposed in a concealed manner under the actuating element and in the unlocked state projects in axial direction with at least one part beyond the end of the actuating element.

In a further refinement of the invention, it is proposed that the connecting means of the clamping element is formed by an axial face, which for bracing and fixing purposes is movable over a corresponding axial supporting face of the supporting element, and at least one of the faces has in peripheral direction an inclination for translating a rotational movement into an axial movement. Such connecting means are particularly inexpensive to manufacture, and indeed in particular by means of radially extending projections. When the clamping element is formed by at least one sheet-metal part, the latter may be guided within a small radial installation space from an acting point radially outside of the basic body and possibly other components in axial direction relative to the supporting element, with the result that design clearances may arise and, on the whole, radial installation space may be saved.

Additional components, installation space and assembly outlay may moreover be saved in that the sheet-metal part is firmly connected to a component which forms a spring

support for a compression spring loading the locking element and/or the supporting element is formed by a rotational coupling ring. It is also possible for the clamping element and/or the sheet-metal part to be constructed integrally with a component forming a spring support.

Further advantages arise from the following description of the drawings. Embodiments of the invention are illustrated in the drawings. The drawings, description and claims contain numerous features in combination. The person skilled in the art will expediently consider the features also individually and collect them into meaningful further combinations.

In the drawings:

Fig. 1 shows a longitudinal section through a tool holder according to the invention,
Fig. 2 shows an actuating element and a clamping element from Fig. 1 obliquely from above,
Fig. 3 shows a variant of Fig. 1 and
Fig. 4 shows a detail of an exploded view of the variant of Fig. 3.

Fig. 1 shows a tool holder, which is intended for a drilling and/or striking tool machine in particular for drilling with diamond tools and/or diamond bits. The tool holder may be connected either permanently or removably to the tool machine, which may be either hand-guided or clamped in a drilling stand.

The tool holder comprises a basic body 10, which is drivable so as to rotate about a longitudinal axis. The basic body 10 at the tool side has a location opening 14,

into which a tool 78 is insertable by a tool shank 16. Over a receiving region 66 the location opening 14 is of a conical construction. Adjoining the receiving region 66 at the machine side is a cylindrical region 68, which changes in a stepped manner into a hollow-cylindrical core region 70 of the basic body 10. Disposed at the transition point between the cylindrical region 68 and the core region 70 is an elastic ring 72, which serves as an end stop and sealing body for the inserted tool 78.

Formed in the basic body 10 in the conical receiving region 66 are three holes 22, of which one is shown in section and another is shown in plan view in Fig. 1. The holes 22 extend, in axial direction 74 towards the tool 78, inclined radially inwards relative to the axis of rotation and are aligned in each case at the inside with an annular groove 76 in the tool shank 16. The holes 22 open in each case radially outwards into an outwardly open pocket 80 in the basic body 10.

Disposed in each of the holes 22 is a locking element 18, which comprises two bulbous ends 20, 84, which are connected by a web 82 of a tapered cross section. An inner, approximately spherical end 20 projects through the hole 22 into the location opening 14 and hence into the annular groove 76 in the tool shank 16. An outer, approximately lemon-shaped end 84 of the locking element 18 projects through the pocket 80 radially beyond the basic body 10.

The locking element 18 is overlapped radially by an actuating sleeve 24 made of plastics material, which concentrically surrounds the basic body 10 and is guided so as to be axially displaceable on the latter. In the direction 74 towards the tool 78 the actuating sleeve 24 is secured by means of a retaining ring 88 on the basic body 10. Provided inside the actuating sleeve 24 is a

shoulder 90, which is used to drive a stop ring 92 upon displacement of the actuating sleeve 24 in the axial direction 54 away from the tool 78.

At its end facing the locking element 18 the stop ring 92 forms, in axial direction 74 towards the tool 78, an obliquely inwardly inclined stop face 94, against which the outer end 84 of the locking element 18 lies. Against the opposite axial side of the outer end 84 a supporting ring 50 is supported by a supporting face 96, which supporting ring at the machine side forms a spring support 52 for a compression spring 48 and comprises a hollow-cylindrical extension 98, which likewise at the machine side has a radially inwardly directed collar 100. One end of the compression spring 48 is guided on the extension 98. The compression spring 48 is supported by a machine-side end against a spring support 46, which is formed on a clamping element 32 of a clamping apparatus 28. The compression spring 48 acts in the direction 74 towards the tool 78 via the supporting ring 50 upon the locking element 18.

The clamping element 32 is connected by an internal thread 40 to an external thread 38 of the basic body 10, which forms a supporting element of the clamping apparatus 28. The clamping element 32 advantageously has at its machine-side end three driving wings 104, 106, 108, which are arranged uniformly distributed over the periphery and extend radially outwards and in axial direction 54 over a machine-side end 102 of the clamping element 32 (Fig. 2). The clamping element 32, while being designed as a separate component to the actuating sleeve 24, is however actuable by means of the actuating sleeve 24, namely in that the driving wings 104, 106, 108 positively engage radially outwards into three pockets 110, 112, 114 formed on the actuating sleeve 24 in direction of rotation.

When the tool 78 is inserted into the tool holder, the tool shank 16 is pushed into the location opening 14. The locking elements 18 are pressed radially outwards and, in the process, press the supporting ring 50 axially backwards in direction 54 counter to the action of the compression spring 48. The outer ends 84 of the locking elements 18 in said case slide along the stop face 94 of the stop ring 92, the position of which remains unchanged.

As soon as the tool shank 16 has been inserted sufficiently deeply into the location opening 14, the locking elements 18, loaded by the compression spring 48, latch with their inner end 20 into the annular groove 76 of the tool shank 16. The tool machine is, in principle, capable of operation. Rotational coupling of the tool 78 is effected by means of a rotational coupling ring 118, which with three radially inwardly directed driving fingers 122 is non-rotatably connected to the tool shank 16 and with three radially outwardly directed driving fingers 120 engages through outwardly open holes 132 of the basic body 10 and via the driving fingers 120 in the holes 132 is positively connected to the basic body 10 in direction of rotation.

In order however to brace the tool shank 16 to a greater extent so that it is in particular, given the tensile forces acting upon it, also always fixed without play in direction 74 in the tool holder, the locking elements 18 are further braced and fixed by the clamping apparatus 28. In said case, via the actuating sleeve 24 the clamping element 32 is rotated relative to the basic body 10 counter to the direction of rotation of the tool 78, namely, viewed in axial direction 74 towards the tool 78, in an anticlockwise direction. The clamping element 32 therefore moves by virtue of the threads 38, 40, which

are designed as left-handed threads, in axial direction 74 towards the tool 78, further preloads the compression spring 48 and comes into contact with a stop face 116 on the collar 100 of the supporting ring 50. Further rotation of the clamping element 32 in an anticlockwise direction leads by virtue of the threads 38, 40 to an axial force in direction 74 towards the tool 78 upon the supporting ring 50, which acts with its supporting face 96 upon a conical face of the outer end 84 of the locking element 18 and presses the latter to a greater extent radially inwards into the annular groove 76 of the tool shank 16. An operator of the tool machine and/or tool holder may, by means of a torque applied to the actuating sleeve 24, adapt a bracing of the tool shank 16 to a weight of the tool 78, i.e. he may brace a heavy tool 78 to a greater extent and a lightweight tool to a lesser extent in the tool holder.

When the tool 78 is to be removed from the tool holder, first the clamping element 32 is rotated by means of the actuating sleeve 24 in the direction of rotation of the tool 78 on the basic body 10 and is, in said case, screwed in the axial direction 54 away from the tool 78 until its machine-side end 102 comes into contact with a limit stop washer 124. The clamping element 32, as it rotates on the basic body 10, moves in axial direction 54 relative to the actuating sleeve 24 and pushes itself with its machine-side ends 56, 58, 126 of the driving wings 104, 106, 108 in the axial direction 54 away from the tool 78 over a machine-side end 60 of the actuating sleeve 24. When the clamping element 32 lies with its end 102 against the limit stop washer 124, the colour-marked ends 56, 58, 126 signal an unlocking position of the clamping element 32 to the operator.

The actuating sleeve 24 is then displaced on the basic body 10 in the axial direction 54 away from the tool 78.

The actuating sleeve 24, in said case, via the shoulder 90 displaces the stop ring 92 against the locking element 18. The locking element 18 is initially tilted by the stop ring 92 in the pocket 80 until the outer end 84 comes into contact with a bottom face of the pocket 80. As soon as the outer end is lying against the bottom face, the tilting movement is ended and the stop ring 92 axially drives the locking element 18 counter to the action of the compression spring 48. The locking element 18 is moved radially outwards out of the hole 22, and the annular groove 76 of the tool shank 16 is cleared.

Figs. 3 and 4 show an alternative tool holder to Figs. 1 and 2. Components remaining substantially identical are in principle provided with the same reference characters. Furthermore, with regard to features and functions which remain identical, reference may be made to the description pertaining to the embodiment in Figs. 1 and 2.

The tool holder has a clamping apparatus 30 comprising a clamping element 34 formed by three sheet-metal shells (Fig. 4). The sheet-metal shells engage in each case with a radially extending projection 128 into an annular groove 138 of a supporting ring 62, which forms a spring support 64 for a compression spring 48 loading a locking element 18. The compression spring 48 is supported at the machine side against a stop plate 140, which is secured by means of a clamping ring 142 in the axial direction 54 away from the tool 78 on a basic body 12 of the tool holder.

The sheet-metal shells are disposed in direction of rotation positively in longitudinal pockets 130, which are uniformly distributed over the periphery at the inner periphery of an actuating sleeve 26 made of plastics

material, and extend in axial direction 54 towards the tool 78 radially outside of the basic body 12.

At a tool-side end the sheet-metal shells have connecting means 44, which are formed by radially inwardly extending projections and at the machine side form faces, which in peripheral direction have an inclination for translating a rotational movement into an axial movement. A supporting element 36 of the clamping apparatus 30 is formed by a rotational coupling ring, which comprises three radially inwardly directed driving fingers 122 distributed uniformly over the periphery for rotational coupling of the tool 78 and three radially outwardly directed driving fingers 42 distributed uniformly over the periphery, which engage through outwardly open holes 132 of the basic body 12 and in the holes 132 are positively connected to the basic body 12 in direction of rotation. The radially outwardly directed driving fingers 42 project radially beyond the basic body 12 and form connecting means of the clamping apparatus 30 with tool-side axial supporting faces. The rotational coupling ring is supported at the machine side against a stop 134 formed by the basic body 12 and is secured at the tool side by means of a clamping ring 136 on the basic body 12.

In an unlocked state of the clamping apparatus 30 the connecting means 44 of the sheet-metal shells lie, in the axial direction 54 away from the tool 78, in front of spaces between the driving fingers 42 of the rotational coupling ring and/or of the supporting element 36. During unlocking of the locking elements 18 by the actuating sleeve 26, the connecting means 44 may be conveyed in the axial direction 54 away from the tool 78 between the driving fingers 42. The actuating sleeve 26 is supported by a stop 146 at its inner periphery via a retaining ring 86 in axial direction 74 towards the

tool 78 on the basic body 12 and is held captive on the basic body 12.

To brace and fix the locking elements 18, the connecting means 44 are rotated with their machine-side faces over the tool-side supporting faces of the driving fingers 42, namely counter to the direction of rotation of the tool 78. By virtue of the inclination in peripheral direction of the faces of the connecting means 44, a torque introduced via the actuating sleeve 26 is converted into an axial force acting in the direction 74 towards the tool 78 upon the supporting ring 62, which acts with its supporting face 96 upon a conical face of an outer end 84 of the locking element 18 and presses the latter to a greater extent radially inwards into an annular groove 76 of the tool shank 16. By means of a torque applied to the actuating sleeve 26 an operator of the tool machine or tool holder may adapt a bracing of the tool shank 16 to a weight of the tool 78.

Before the tool 78 may be unlocked in a known manner, the bracing of the locking elements 18 by the clamping apparatus 30 has to be cancelled. By means of the actuating sleeve 26 the sheet-metal shells are rotated on the basic body 12, namely until the connecting means 44 come to lie, in the axial direction 54 away from the tool 78, in front of the spaces between the driving fingers 42. An operator may recognize this from the fact that slots 144 come to lie above the driving fingers 42.

Reference characters

| | | | |
|---|---|---|---|
| 10 | basic body | 56 | part |
| 12 | basic body | 58 | part |
| 14 | location opening | 60 | end |
| 16 | tool shank | 62 | component |
| 18 | locking element | 64 | spring support |
| 20 | end | 66 | receiving region |
| 22 | hole | 68 | region |
| 24 | actuating element | 70 | core region |
| 26 | actuating element | 72 | ring |
| 28 | clamping apparatus | 74 | direction |
| 30 | clamping apparatus | 76 | annular groove |
| 32 | clamping element | 78 | tool |
| 34 | clamping element | 80 | pocket |
| 36 | supporting element | 82 | web |
| 38 | connecting means | 84 | end |
| 40 | connecting means | 86 | retaining ring |
| 42 | connecting means | 88 | retaining ring |
| 44 | connecting means | 90 | shoulder |
| 46 | spring support | 92 | stop ring |
| 48 | compression spring | 94 | stop face |
| 50 | component | 96 | supporting face |
| 52 | spring support | 98 | extension |
| 54 | direction | 100 | collar |

102 end
104 driving wing
106 driving wing
108 driving wing
110 pocket
112 pocket
114 pocket
116 stop face
118 rotational coupling ring
120 driving finger
122 driving finger
124 limit stop washer
126 part
128 projection
130 longitudinal pocket
132 hole
134 stop
136 clamping ring
138 annular groove
140 stop plate
142 clamping ring
144 slot
146 stop

Claims

1. Tool holder for a drilling and/or striking tool machine, having a basic body (10, 12), which has a location opening (14) for inserting a tool shank (16), having at least one locking element (18), which for locking the tool shank (16) engages with an inner end (20) radially through a hole (22) in the basic body (10, 12) into the location opening (14) and is adjustable by means of an actuating element (24, 26) out of a locking position into an unlocking position and vice versa, and having a clamping apparatus (28, 30), which comprises at least one actuable clamping element (32, 34) and at least one supporting element (36), to which elements connecting means (38, 40, 42, 44) are applied for bracing and fixing the locking element (18), **characterized in that** the clamping element (32, 34) is designed as a separate component to the actuating element (24, 26).

2. Tool holder according to claim 1, characterized in that the actuating element (24, 26) is made of plastics material.

3. Tool holder according to one of the preceding claims, characterized in that the clamping element (32, 34) is actuable by means of the actuating element (24, 26).

4. Tool holder according to one of the preceding claims, characterized in that a relative movement between the clamping element (32) and the actuating element (24) is utilized to trigger a signal.

5. Tool holder according to one of the preceding claims, characterized in that the connecting means (38, 40) are designed as threads.

6. Tool holder according to claim 5, characterized in that the clamping element (32) is formed by a component, which forms a spring support (46) for a compression spring (48) loading the locking element (18).

7. Tool holder according to claim 5 or 6, characterized in that the clamping element (32) in the locked state acts upon the locking element (18) via a component (50), which forms a spring support (52) for a compression spring (48) loading the locking element (18).

8. Tool holder according to claim 4 and one of claims 5 to 7, characterized in that the clamping element (32) in the locked state is disposed in a concealed manner under the actuating element (24) and in the unlocked state projects in axial direction (54) with at least one part (56, 58) beyond an end (60) of the actuating element (24).

9. Tool holder according to one of claims 1 to 4, characterized in that the connecting means (42, 44) of the clamping element (34) is formed by an axial face, which for bracing and fixing purposes is movable over a corresponding axial supporting face of the supporting element (36), and at least one of the faces has in peripheral direction an inclination for translating a rotational movement into an axial movement.

10. Tool holder according to claim 9, characterized in that the clamping element (34) is formed by at least one sheet-metal part.

11. Tool holder according to claim 10, characterized in that the sheet-metal part is firmly connected to a component (62), which forms a spring support (64) for a compression spring (48) loading the locking element (18).

12. Tool holder according to claim 10 or 11, characterized in that the supporting element (36) is formed by a rotational coupling ring.

13. A tool holder substantially as described herein with reference to the accompanying drawings.

**Application No:** GB 0115618.1 **Examiner:** David Harness
**Claims searched:** 1-13 **Date of search:** 28 November 2001

# Patents Act 1977
# Search Report under Section 17

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): B3B (BHS2, BHS1, BHS6, BHS9): B4C (C1F, C6BX)

Int Cl (Ed.7): B23B 31/02, 31/10, 31/103, 31/107, 31/113: B25D 17/08

Other: Online: WPI, EPODOC, PAJ

**Documents considered to be relevant:**

| Category | Identity of document and relevant passage | | Relevant to claims |
|---|---|---|---|
| X | GB2322576A | (BOSCH) See figures. | 1 at least |
| X | GB2302300A | (BOSCH) See figures. | 1 at least |
| X | GB2286351A | (BOSCH) See particularly locking ball 12 and locking element 3. | 1 at least |
| X | EP0765707A2 | (HILTI) See figures. | 1 at least |
| X | US5000631 | (HILTI) See particularly attachment screw 3 and locking element 5 | 1 at least |

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|---|---|---|---|
| X | Document indicating lack of novelty or inventive step | A | Document indicating technological background and/or state of the art. |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category. | P | Document published on or after the declared priority date but before the filing date of this invention. |
| & | Member of the same patent family | E | Patent document published on or after, but with priority date earlier than, the filing date of this application. |